Let $x = (x_1, x_2)$ and $y = (y_1, y_2)$ and let kernel $kbedefinedasfollows$:

k(x,y) = 1 + 3 x_1^2 y_1^2 + 5 x_2^2 y_2^2 + 7 x_1 x_2 y_1 y_2

$whichtransformation\phi$$ does this kernel correspond to?

- a. $\phi(x) = (1, \sqrt{3}x_1^2, \sqrt{5}x_2^2, \sqrt{7}x_1x_2)$
- b. $\phi(x) = (1, 3x_1^2, 5x_2^2, 7x_1x_2)$
- c. $\phi(x) = (1, \sqrt{3}x_1^2, 5x_2^2, \sqrt{7}x_1x_2)$
- d. $\phi(x) = (1, x_1^2, x_2^2, x_1x_2)$

Let $x = (x_1, x_2)$ and $y = (y_1, y_2)$ and let kernel k be defined as follows:

$k(x, y) = e^{x_1+y_1} + e^{x_2+y_2} + 0.25x_1^2y_1^2 + \log(x_1)\log(y_1) + \log(x_2)\log(y_2)$

which transformation ϕ does this kernel correspond to?

- a. $\phi(x) = (e^{x_1}, e^{x_2}, 0.25x_1^2, \log(x_1) + \log(x_2))$
- b. $\phi(x) = (e^{x_1x_2}, 0.25x_1^2, \log(x_1) + \log(x_2))$
- c. $\phi(x) = (e^{x_1}, e^{x_2}, 0.5x_1^2, \log(x_1 + x_2))$
- d. $\phi(x) = (e^{x_1}, e^{x_2}, 0.5x_1^2, \log(x_1), \log(x_2))$

Consider the RBF kernel from lectures $k(x_i, x_j) = \exp(-\frac{1}{2\sigma^2}\|x_i - x_j\|^2)$. Suppose we have three points z_1, z_2, x, and you are told that geometrically, z_1 is very close to x, and z_2 is geometrically far away from x. Which of the following statements are true?

A.$k(z_1, x)$ is close to 1, and $k(z_2, x)$ is close to 0

B.$k(z_1, x)$ is close to 0, and $k(z_2, x)$ is close to 1

C.$k(z_1, x)$ is much larger than 1, and $k(z_2, x)$ is much smaller than 0

D.$k(z_1, x)$ is much smaller than 0, and $k(z_2, x)$ is much smlargerller than 1

- a. A
- b. B
- c. C
- d. D

Given the following data $X = [(2,3),(1,4),(4,5),(5,6)]$ and corresponding labels $(-1,-1,+1,+1)$. How many support vectors will be identified by a standard implementation of the SVM?

- a. 2
- b. 3 ✔
- c. 4
- d. impossible to tell from the given information

Consider the following dataset: $X = [-\pi, -0.5\pi, 0, 0.5\pi, \pi]$ with corresponding labels $y = [1,-1,-1,-1,1]$. Which of the following transformations would make the data linearly separable?

A. $\phi(x) = (x, cos(x))$

B. $\phi(x) = (x, sin(x))$

C. $\phi(x) = (x, cos(0.5x))$

D. $\phi(x) = (x, sin(0.5x))$

- a. A
- b. B
- c. C
- d. D

(c) also correct